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ABSTRACT

The effectiveness of different frequencies of summarization during studying and processing prose passages was compared. The 48 college students in the study were equally divided into a control group (normal study techniques), a frequent summarization group that created four noncumulative summaries at equally spaced intervals throughout the passage they read, and an infrequent summarization group that created only two noncumulative summaries. All the subjects read a 2,500 word excerpt from a geology textbook and were tested five days later. Although the frequent summarization group scored higher than the infrequent group when their summaries were analyzed, the infrequent group scored higher on the essays written during posttesting. Two possible explanations for these differences were that the groups engaged in quantitatively and qualitatively different cognitive processing, and that the frequent summarization group spent more time summarizing and less time in actually studying the material than the other groups. The latter explanation was supported when word counts of summaries were compared; the frequent group's mean word count for the summaries was 268.44, compared to a mean word count of 203.38 for the infrequent group. (RL)

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Text Processing: Effects of Summarization Frequency on Performance

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Text Processing: Effects of Summarization Frequency on Performance

Introduction

In recent years there has been an increase in research directed toward analyzing and manipulating the cognitive activities students engage in when interacting with text (e.g., Dansereau, Collins, McDonald, Holley, Garland, Diekhoff, & Evans, 1978; Kintsch & Van Dijk, 1978). One potentially important finding arising from this inquiry is the facilitating effect of intermittent paraphrasing (summarizing) on the recall of prose (Anderson & Biddle, 1975; Dansereau, 1978; Ross & DiVesta, 1976). Individuals taught or instructed to explicitly summarize what they have read typically exhibit significantly better performance on recall measures than individuals using their own study methods or those using a read/re-read strategy. Unfortunately, this phenomenon has not undergone systematic investigation and consequently, has not been related to existing theoretical perspectives. Further, the lack of detailed information on this phenomenon has inhibited the application of summarization strategies in real-world educational settings. The present study was designed to be a first step in rectifying this state of affairs.

Of particular interest is the effect of the frequency of noncumulative summarizing on different performance indices. It is suggested that frequent summarizing will focus the learner's attention on the microstructure of the text (i.e., details, Kintsch

& VanDijk, 1978) perhaps at the expense of the macrostructure (main ideas, organizing framework, gist). Conversely, infrequent summarization should lead to an increase in focus on the macrostructure perhaps at the expense of the details. If the above conditions pertain, explanations based on the notion of depth of semantic processing (e.g., Andre & Womack, 1978; Craik & Lockhart, 1972) would predict that frequent summarizing would lead to better recall performance than infrequent summarizing, while explanations based on the importance of higher-order organizational schemes for memory would predict the opposite. Although at their present stages of development these theoretical perspectives would lead to predictions of "across the board" performance differences, it is very likely that performance outcomes will be influenced by the type of recall measures employed. Consequently, in the proposed study multiple measures (essay, short-answer, multiple choice, and cloze tests) were used to determine interactions with manipulation of summarization frequency and to establish boundary conditions relevant to the use of summarization as a learning strategy.

Method

Subjects

Forty-eight General Psychology students participated in the 3-session experiment. They received 4 hours of experimental credit, and $3.00 for their participation. The participants were randomly assigned to one of three experimental groups: Frequent Summarization (n=16), Infrequent Summarization (n=16), and Control (n=16).

Procedure

The experiment was divided into three sessions.

Session 1 -- An overview of the experiment was presented and all participants completed the Delta Vocabulary Test.

Session 2 -- All participants received packets containing study instructions and a 2,500-word excerpt from a geology textbook. After reading the instructions, they studied the passage for 55 minutes. The Frequent Summarization group was instructed to create four non-cumulative summaries at equally spaced intervals throughout the passage. The Infrequent Summarization group was instructed to create two non-cumulative summaries. The Control group was instructed to use their normal study techniques.

Session 3 -- Five days after Session 2, all groups took essay, short-answer, multiple choice and cloze tests over the geology excerpt.

Materials

The Delta Vocabulary Test (Deignan, 1973), which correlates well with measures of verbal aptitude, was used as a covariate in subsequent analyses.

The dependent measures consisted of the following tests:

Essay -- Consisted of a single question asking for a summary of major points of the passage. (17 minutes)

Short Answer -- Consisted of defining nine words taken from the passage and answering two additional questions. (12 minutes)

Multiple Choice -- Contained 24 items (10 minutes)

Cloze -- Fill-in-the-blank questions (10 minutes)

The text passage was a 2,500-word excerpt from a geology textbook on plate tectonics.

Results

All tests were scored without knowledge of group affiliation according to pre-determined keys. Essay tests were scored for both content and organization. See Table 1 for means and standard deviations of the test scores for each group. The results of one-way analyses of covariance (vocabulary scores as the covariate and group affiliation as the single, fixed factor) indicated that group differences were significant with the content and organization components of the essay test, $F(2, 44) = 3.20$, $p < .05$; $F(2, 44) = 4.60$, $p \leq .05$, respectively. The other three tests were non-significant. Tukey post hoc comparisons indicated that in both cases the Infrequent Summarization group outperformed the Control group ($p \leq .05$), while all other differences were non-significant.

Supplementary analyses were done on the note summaries produced during studying by Frequent and Infrequent Summarization groups. The note summaries were scored using the same criteria as was used in scoring the essay test (See Table 2 for means and standard deviations).

Insert Table 1 and Table 2 about here

Table 1

Means and Standard Deviations for Test Scores

		ESSAY				SHORT-ANSWER		MULTIPLE CHOICE		CLOZE	
		Content		Organization							
		Non-justed	Ad-justed*	Non-justed	Ad-justed	Non-justed	Ad-justed	Non-justed	Ad-justed	Non-justed	Ad-justed
Frequent Summarization (n=16)	$\bar{x}$	13.63	13.82	3.81	3.88	21.19	21.57	22.06	22.25	13.31	13.52
	sd	6.08	5.90	1.67	1.62	10.86	10.55	4.86	4.74	4.09	3.75
Infrequent Summarization (n=16)	$\bar{x}$	18.38	18.17	4.50	4.43	23.94	23.53	22.50	22.30	14.00	13.78
	sd	6.57	6.47	1.58	1.50	9.62	8.19	4.49	3.80	3.34	2.67
Control (n=16)	$\bar{x}$	12.50	12.51	2.94	2.94	20.00	20.02	21.56	21.57	13.06	13.08
	sd	7.19	6.69	1.25	0.74	7.78	6.79	4.55	4.01	4.37	3.51

*Adjusted scores, using Delta Vocabulary test as covariate.

Table 2

Means and Standard Deviations for Notes and Essay

		CONTENT				ORGANIZATION			
		Notes		Essay		Notes		Essay	
		Non-justed	Ad-justed*	Non-justed	Ad-justed	Non-justed	Ad-justed	Non-justed	Ad-justed
Frequent Summarization (n=16)	$\bar{x}$	26.31	26.54	13.63	13.82	6.06	6.10	3.81	3.88
	sd	8.15	7.70	6.08	5.90	1.52	1.43	1.67	1.62
Infrequent Summarization (n=16)	$\bar{x}$	21.63	21.40	18.38	18.17	5.31	5.27	4.50	4.43
	sd	9.43	8.44	6.57	6.47	1.83	1.79	1.58	1.50

*Adjusted scores, using Delta Vocabulary test as covariate.

Two-way analysis of covariance (Delta as covariate, note summaries vs. essays as one factor and treatment groups as the other) showed that the main effect for notes vs. essay was significant for both content, $F(1,59) = 17.61$, $p \leq .001$, and organization, $F(1,59) = 13.62$, $p \leq .001$. This finding was not surprising given that the notes were created at time of studying, while the essays were created 5 days later. More importantly, the interactions between notes vs. essay and groups approached significance on organization ($p \leq .08$). and reached significance ($p \leq .02$) with content. Both interaction effects are due to the Frequent Summarization group scoring better than the Infrequent group on the notes and worse on the essay, thus producing a "crossing" interaction.

Discussion

This study replicated findings of prior research on the use of summarization techniques. In particular, the Infrequent Summarization group outperformed the Control (typical study group) on the essay test. This study extended prior research by using longer and more realistic (textbook) material than had been used previously.

The differences between group means were significant on only the essay test. The lack of "across the board" effects due to summarization suggests that this technique may primarily enhance recall rather than recognition. Although it may be argued that the tests were not equally sensitive, our previous research has shown all of these tests to be sensitive to other types of manipulations.

The finding that the infrequent summarization technique (summarizing the material every 1200 words) increases performance on the essay test, suggests that this technique is a more powerful technique than frequent summarization (summarizing every 600 words). To explore this finding further, the notes (summaries produced during study time) were scored and analyzed. The results indicated an interaction between notes vs. actual essay performance and frequent vs. infrequent summarization. The Frequent group outperformed the Infrequent group on the notes while the opposite occurred with the essay tests. Two alternative explanations for this finding are possible: 1) The Infrequent group may have engaged in quantitatively and qualitatively different cognitive processing in creating the note summaries, e.g., they may have had to store the material differently and they may have had to do more structuring and more reorganizing than the Frequent group. The summarization for the Frequent group may have been too easy, i.e., not as much cognitive activity was needed to produce the summaries. 2) The second potential explanation is that the Frequent Summarization group spent more time summarizing and less time in actually studying the material. This possibility is suggested by the mean word count for each group: Mean word count of notes for the Frequent group = 268.44, mean word count of notes for the Infrequent group = 203.38.

Further research is needed to determine which of these two explanations is correct.

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